

CLAIMS

We Claim:

1. A networked computing system comprising:
 - a) a network resource that is to be maintained;
 - b) a lock data area indicating an ownership status of the network resource;
 - c) a lock server process for maintaining the lock data area ;
 - d) a plurality of clients that are to perform maintenance on the network resource, a client being operative to:
 - i) send a command to the lock server process to modify the lock data area to indicate ownership of the network resource by the client;
 - ii) receive a response from the lock server process indicating whether or not ownership of the network resource by the client is indicated by the lock data area;
 - iii) perform maintenance on the network resource only if ownership of the network resource is indicated by the lock data area.
2. The system of claim 1 wherein, if the response indicates that ownership of the network resource by the client is not indicated by the lock data area, the client is operative to:
 - i) set a retry interval timer; and
 - ii) upon expiry of the retry interval timer, send a further command to the lock server process to modify the lock data area to indicate ownership of the network resource by the client.
3. The system of claim 2 wherein, after at least two unsuccessful attempts to modify the lock data area to indicate ownership of the network resource by the client, the client is operative to:
 - i) determine, from lock owner viability data received from the lock server process, whether or not a current lock owner is viable; and

ii) if the current lock owner is not viable, send a command that is configured to establish the client as the lock owner notwithstanding that the client is not the current lock owner.

4. The system of claim 1 wherein the command includes client viability data, the client being operative to, upon successfully modifying the lock data area to indicate ownership of the network resource by the client:

i) set a reacquire interval timer; and

ii) send updated client viability data to the lock server process if maintenance being performed by the client has not been completed when the reacquire interval timer expires.

5. The system of claim 1 wherein each of the plurality of clients has a unique and non-null lock owner ID.

6. The system of claim 1 wherein the lock data area includes lock owner data, lock viability data, and retain interval data, and the command to the lock server process to modify the lock data area includes a set value, a test value, a viability value, and a retain interval value.

7. The system of claim 6 wherein the lock data area contains null data values when the network resource is not owned by any client.

8. The system of claim 6 wherein the lock server process is operative to:
compare the test value in the command with a lock owner value in the lock data area; and
write the set value into the lock owner value if said comparison shows that the test value is equal to the lock owner value.

9. The system of claim 8 wherein the lock server process is operative to send a response to the client after conducting any updates in the lock data area.

10. The system of claim 9 wherein the response includes lock owner data, lock viability data, and retain interval data stored in the network resource.
11. The system of claim 8 wherein the client constructs the command with a set value equal to the client's lock owner ID and a null test value, unless the client has determined that the current lock owner is no longer viable.
12. The system of claim 8 wherein the client is operative to force the lock data area to indicate ownership of the network resource, the network resource nominally being owned by a second client, by sending a command that includes a test value equal to an identity of the second client and a set value equal to an identity of the forcing client.
13. The system of claim 3 wherein the step of determining lock owner viability performed by the client comprises:
comparing lock owner data and lock viability data received in two consecutive responses from the lock server process.
14. The system of claim 13 wherein the client is operative to consider the current lock owner viable if the lock owner data or lock viability data received in two consecutive responses from the lock server process differ, and to otherwise consider the current lock owner non-viable.
15. A client process for maintaining a network resource, authorization to maintain the network resource being indicated by the contents of a lock data area stored on the network resource, the client process being configured to:
send a first request to modify the lock data area to indicate that the client process is authorized to maintain the network resource;
receive a first response indicating whether or not the client process has successfully modified the lock data area to indicate that the client process is authorized to maintain the network resource; and

send maintenance commands to the network resource only if the first response indicates successful modification of the lock data area.

16. The client process of claim 15 wherein the client process is further configured to:
set a first retry interval timer if the first response indicates that the client process has not successfully modified the lock data area to indicate that the client process is authorized to maintain the network resource;

after the first retry interval timer expires, send a second request to modify the lock data area to indicate that the client process is authorized to maintain the network resource;

receive a second response indicating whether or not the client process has successfully modified the lock data area to indicate that the client process is authorized to maintain the network resource; and

send maintenance commands to the network resource only if the second response indicates successful modification of the lock data area.

17. The client process of claim 15 wherein the first response includes first viability data and the second response includes second viability data, the client process being configured to:

compare the first viability data with the second viability data;

based on the comparison, either set a second retry interval timer or send a third request to modify the lock data area, the third request being configured to ensure that the lock data area will be modified to indicate that the client process is authorized to maintain the network resource;

receive a third response indicating whether or not the client process has successfully modified the lock data area to indicate that the client process is authorized to maintain the network resource; and

send maintenance commands to the network resource only if the third response indicates successful modification of the lock data area.

18. The client process of claim 15 wherein the client process is further operative to:

set a reacquire interval timer if the client process receives a response indicating successful modification of the lock data area to indicate that the client process is authorized to maintain the network resource;

provide viability data to be stored in the lock data area;

on every expiry of the reacquire interval timer, restart the reacquire interval timer and send a request to modify the lock data area with new viability data to indicate that the client process continues to viably hold the network resource, and

upon completion of the maintenance commands by the network resource, cancel the reacquire interval timer and send a new request to modify the lock data area with null values to indicate that the network resource is no longer owned by any client process.

19. The client process of claim 17 wherein the client process is further operative to:
abort the intended transmission of maintenance commands to the network resource with an appropriate error indication if the first, second, and third responses indicate that the client process has not successfully modified the lock data area to indicate that the client process is authorized to maintain the network resource.

20. The client process of claim 16 wherein the duration of the retry interval timer is at least twice the duration of retain interval data returned in a response sent by the lock server process.

21. A lock server process for use in regulating maintenance activities performed on a network resource, comprising:

a lock data area for indicating an ownership status of the network resource, the lock data area including lock owner data; and

a lock server routine, the lock server routine being operative to receive an instruction to modify the lock owner data, the instruction including a set value and a test value, the lock server routine being operative to:

compare the test value against the lock owner data; and

replace the lock owner data with the set value if the test value is the same as the lock owner data.

22. The lock server process of claim 21 wherein the lock data area further includes viability data and the instruction further includes a viability value, the lock server routine in use being operative to replace the viability data in the lock data area with the viability value in the instruction if the test value is the same as the lock owner data.

23. The lock server process of claim 21 wherein the lock data area further includes retain interval data and the instruction further includes a retain interval value, the lock server routine in use being operative to replace the retain interval data in the lock data area with the retain interval value in the instruction if the test value is the same as the lock owner data.

24. The lock server process of claim 22 wherein the lock data area further includes retain interval data and the instruction further includes a retain interval value, the lock server routine in use being operative to replace the retain interval data in the lock data area with the retain interval value in the instruction if the test value is the same as the lock owner data.

25. The lock server process of claim 21 wherein the lock server routine is operative to respond to the instruction with the lock owner data after conducting any updates in the lock data area.

26. The lock server process of claim 22 wherein the lock server routine is operative to respond to the instruction with the lock owner data and the viability data after conducting any updates in the lock data area.

27. The lock server process of claim 23 wherein the lock server routine is operative to respond to the instruction with the lock owner data and the retain interval data after conducting any updates in the lock data area.

28. The lock server process of claim 24 wherein the lock server routine is operative to respond to the instruction with the lock owner data, the viability data and the retain interval data after conducting any updates in the lock data area.

29. The lock server process of claim 21 wherein the lock server routine is operative to modify the lock data area with null values to indicate that the network resource is not owned by any client process, whenever the network resource is powered on or is reset via an operator command.

30. The lock server process of claim 21 wherein the lock data area is organized as a plurality of locks for control of concurrent maintenance operations performed on the network resource.